REMARKS

Claims 12-40 are pending in the present application. In the Office Action dated October 4, 2005, claims 12-16, 20-23, 28, 30 and 37-39 were rejected under 35 U.S.C. 102(b) as being anticipated by Matsumoto (U.S. Patent No. 5,877,844). Claims 17 and 24-27, 29, and 33-36 were rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto in view of Elliott, Jr. (U.S. Patent No. 5,806,424). Claims 18 and 19 were rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto in view of Walker (U.S. Patent No. 6,359,662). Claims 31 and 32 were rejected under 35 U.S.C. 103(a) as being unpatenable over Matsumoto in view of Dabbaj (U.S. Patent No. 4,958,150). Claim 40 was rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto in view of Makinouchi et al. (U.S. Patent No. 5,699,145). Applicant respectfully requests reconsideration of the application in view of the foregoing amendments and the following remarks.

The disclosed embodiments of the invention will now be discussed in comparison to the prior art. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the prior art subject matter, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

The disclosed embodiments of the present invention are directed to an apparatus for masking display element defects in a display device. In one particular embodiment, a display device includes a plurality of display elements disposed on a display surface, wherein at least one of the display elements is at least partially defective. A signal source is coupled to the display that provides signals to the display so that a visual image is formed on the display. A translation unit coupled to the display surface is configured to translate the display surface, and imparts a periodic motion to the display surface. A control unit is further coupled to the translation unit and a signal source, the control unit controls the moving the display while controlling the signal source to correspondingly shift the display signals. Thus, when the display signals are shifted and displayed, the defective display elements are concealed while presenting a stable image to a stationary viewer.

All the display elements may be shifted by physically translating the display surface a known distance either vertically, horizontally or in combination of vertical and

horizontal directions, depending on the location of display element defects. In addition, the image elements must be moved a distance that equals the physical translation of the known distance, but in the direction or directions opposite that known distance, so that the position of the respective image elements remains stationary with respect to the viewer. After the shifted image is displayed and the image signal level is maintained, the display elements may be redirected back to their respective initial positions, thereby concealing any targeted defected display elements. The repetitive physical movement of the display elements when combined with the corresponding shift in the images being displayed presents to a viewer the perception of a complete and continuous image on the display surface.

Referring now to Figures 2 and 3 of the application, a display region 11 is shown with adjoining display elements 20-31 that correspond to physical areas on a display surface 10. In Figure 2, the display elements 20-31 on the region 11 are arranged in rows 35-37 and columns 38-41. Image elements P_{20}-P_{31} are respectively associated with the display elements 20-31, and each image element P_{20}-P_{31} is individually projected onto the region 11 by image signals V_{20}-V_{31}. The image signals V_{20}-V_{31} are provided by the signal source, and are applied to the display region 11 to create an image, or portion of an image, that may be seen visually. A single display element 25, located in the region 11, is at least partially unresponsive to the applied input signal V_{25}, while the display elements 20-23, 24, 26, 27 and 28-31 are fully responsive and function normally to the image signals V_{20}-V_{23}, V_{24}, V_{26}, V_{27} and V_{28}-V_{31} respectively. The defect at the display element 25 may exhibit constant illumination, partial illumination, or no illumination, depending on the display technology used, and in particular mode of failure. Due to the defect in the display element 25, the image element P_{25} associated with the image signal V_{25} does not fully appear in the display element 25.

Referring to Figure 3, the single defective display element 25 is shown after the region 11 has been physically translated a distance of one column width to the left. In response to the physical translation of the region 11 to the left, the image elements P_{20}-P_{31} must be simultaneously translated a corresponding distance of one column width to the right by redirecting the image signals image elements V_{20}-V_{31} one column width to the right. As a result, the information previously associated with the input signal V_{25} that could not be fully viewed in the defective display element 25, is now viewed in display element 26. At the same time,

although the region 11 has been translated by the width of one column, the image element P_{25} has maintained a position that is unchanged relative to a viewer of the region 11. After all image elements P_{20}-P_{31} have been displayed by the redirected image signals V_{20}-V_{31}, the region 11 is physically translated one column width to the right so that the image elements P_{20}-P_{31} are projected onto respective display elements 20-31 once again, where the image is again displayed as initially positioned in Figure 2. Accordingly, the displayed image is generally indistinguishable from an image that would be viewed by an individual who was viewing the same image on a stationary display device that did not have any defects.

The primary reference cited in the Office Action is the patent to Matsumoto, which describes an image exposure method that uses a liquid crystal display (LCD) panel. An image is exposed onto a photosensitive material by dividing the image into pixels, arranged in a matrix pattern on the LCD panel, and by adjusting respective amounts by which light is transmitted through a plurality of the pixels. According to the Matsumoto patent, when the amount of light cannot be properly adjusted due to a defective pixel, the defective pixel is corrected by changing the relative position of the group of pixels and using the density of light of pixels around the defective pixel to compensate for the defect. The defective pixel may be the result of elements in the display that fail to transmit light ("black point defects") or elements that undesirably transmit light fully ("white point defects"). Figure 4, for example, shows a plurality of peripheral pixels (display elements) whose positions are changed relative to the defective pixel. The defect is compensated for by effecting exposure a plurality of times and successively effecting the pixel displacement, so that the exposure amount close to a desired amount for the particular group of pixels can be achieved. Since a photosensitive material is exposed, all display elements in the display need to undergo a correction after movement in order to avoid overexposing the photosensitive material by the transmitted light.

The Matsumoto reference fails to disclose or fairly suggest, an apparatus whereby an applied signal level is maintained, as the applied signal level is shifted to an adjacent display element. The apparatus as disclosed by Matsumoto, in fact, cannot apply a fixed signal level since it would result in overexposing the photosensitive material. Accordingly, the Matsumoto patent is different, and does not describe masking display element defects as effected by Applicant's embodiments.

The remaining references cited in the Office Action do not remedy the above deficiencies of the Matsumoto patent.

Turning now to the claims, the patentably distinct differences between the cited references and the claim language will be specifically pointed out. Amended claim 12 recites, in part, "a control unit coupled to the translation unit and the display signal source that is structured to exchange signals with the translation unit and the display signal source to controllably direct the movement of the display unit and to compensatingly shift the input signals in the signal source, the shifted signals being maintained at a fixed signal level as the input signals are shifted, the shifted signals concealing display element defects on the display surface when displayed." As explained above, the Matsumoto patent does not teach an apparatus for masking defects as specified in claim 12. In particular, the Matsumoto patent does not disclose or fairly suggest the limitations of "the shifted signals being maintained at a fixed signal level as the input signals are shifted." Instead, Matsumoto teaches applying a compensation to the shifted signals to avoid overexposing portions of the photosensitive material. Claim 12 is therefore not anticipated by the Matsumoto patent.

Amended claim 23 recites, in part, "a control unit coupled to the signal source unit and the translation unit that is operable to command the translation unit to shift the display in a predetermined direction and to command the signal source unit to correspondingly shift the image signals provided to the display device by the signal source unit to compensate for the display device shift before displaying the shifted signals maintained at a fixed signal level, and to command the display thereof to obtain a stable image that conceals the at least one defective display element." As described previously, the Matsumoto patent does not teach maintaining signals at a fixed signal level when masking defects in display surfaces. Instead, the Matsumoto patent teaches compensating the signals, when the signals are shifted, to correct the defect. Accordingly, claim 23 is also not anticipated by the Matsumoto patent.

The remaining claims in the application are patently distinguished over the cited references because of their dependency on patentable independent claims and because of additional limitations added by those claims.

The Office Action also objects to the drawings because Figures 5-7 do not purportedly label the rectangular boxes as required by Rule 1.83. Rule 1.83 merely requires that every feature of the invention specified in the claims needs to be shown in drawings. Figures 5-7 show each feature in the pending claims. The boxes that are shown in Figures 5-7 appear to be labeled properly as required by Rule 1.83 and by Rule 1.84. The Examiner is respectfully asked to specifically point out the correction to be made and Applicant will correct the Figures if necessary.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a timely Notice of Allowance are earnestly solicited.

Respectfully submitted,

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